

CLAIMS

The invention is claimed as follows:

1. A semiconductor light emitting device comprising:

a substrate having a surface that has a difference-in-height portion;

5 a crystal growth layer formed on the surface of the substrate wherein at least a portion of the crystal growth layer is oriented along an inclined plane with respect to the surface of the substrate; and

a first conductive layer, an active layer and a second conductive layer formed on the crystal growth layer in a stacked arrangement and oriented along the inclined
10 plane.

2. The device of claim 1 wherein the substrate comprises a wurtzite compound.

15 3. The device of claim 1 wherein the wurtzite compound forms a layer oriented along a principal plane of the substrate and wherein the inclined plane is inclined with respect to the principal plane.

20 4. The device of claim 1 wherein the inclined plane comprises at least one of a S-plane and a {11-22} plane.

25 5. The device of claim 1 wherein the difference-in-height portion comprises a shape selected from the group consisting of a stripe shape, a rectangular shape, a round shape, a triangular shape, a hexagonal shape and combinations thereof.

6. The device of claim 1 wherein the crystal growth layer comprises a shape selected from the group consisting of a stripe shape, a rectangular shape, a round shape, a triangular shape, a hexagonal shape and combinations thereof.

30 7. The device of claim 1 wherein the crystal growth layer further comprises a portion which is substantially parallel with respect to a principal plane along which at least a portion of the substrate is oriented.

8. The device of claim 1 wherein the semiconductor light emitting device comprises a light emitting diode structure.

9. The device of claim 1 wherein the semiconductor light emitting device
5 comprises a semiconductor laser structure.

10. The device of claim 1 wherein the surface of the substrate is oriented along a C-plane such that an end portion of the different-in-height portion is oriented perpendicular with respect to at least one of a $\langle 1-100 \rangle$ direction and a $\langle 11-20 \rangle$
10 direction and wherein the growth of the crystal growth layer depends on a shape of the difference-in-height portion.

11. The device of claim 1 wherein at least a portion of the crystal growth layer forms a valley having a cross-section that is substantially V-shaped.
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12. The device of claim 11, wherein an electrode is formed on the substantially V-shaped valley.

13. A device of claim 1, wherein said crystal growth layer has a plurality of
20 crystal growth layer portions perpendicularly formed within a plane being approximately parallel to a principal plane of the substrate.

14. The device of claim 1, wherein the crystal growth layer comprises a GaN semiconductor.
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15. The device of claim 1, wherein the crystal growth layer is grown at a temperature of about 1100°C or less.

16. The device of claim 1, wherein the crystal growth layer is grown at
30 pressure of about 100 Torr or more.

17. A semiconductor light emitting device comprising:

a substrate comprising a substrate layer composed of a wurtzite compound formed along a principal plane of the substrate wherein the layer includes a different-in-height portion formed in a surface of the substrate layer;

5 a crystal growth layer formed on the surface of the substrate layer wherein at least a portion of the crystal growth layer is oriented along an inclined plane that is inclined with respect to the principal plane;

a first conductive cladding layer, an active layer and a second conductive layer formed on the crystal growth layer in a sequentially stacked arrangement oriented along two or more planes of the crystal growth layer including the inclined plane such
10 that one or more light emission regions are formed; and
one or more electrodes separately formed in the light emission regions.

15 18. The device of claim 17, wherein the inclined plane comprises at least one of an S-plane and a {11-22} plane.

19. The device of claim 17, wherein the principal plane comprises at least one of a C-plane and a {0001} plane.

20 20. The device of claim 17, wherein wavelengths of two or more kinds of light emitted from the light emission regions are different from each other.

21. The device of claim 20, wherein at least one of a composition and a thickness of the active layer varies with respect to the light emission regions such that the wavelengths are different from each other.

25 22. The device of claim 17, wherein the light emitting device has a light emitting diode structure allowing simultaneous emission of light associated with two or more colors.

30 23. The device of claim 17, wherein the light emitting device has a semiconductor laser structure allowing simultaneous emission of light of two or more colors.

24. The device of claim 17, wherein the substrate layer is oriented along a C-plane such that an end portion of the different-in-height portion is perpendicularly directed with respect to at least one of a $\langle 1-100 \rangle$ direction and a $\langle 11-20 \rangle$ direction and wherein the growth of the crystal growth layer depends on a shape of the different-in-height portion.

25. The device of claim 17, wherein at least a portion of the crystal growth layer forms a valley having a cross-section that is approximately V-shaped.

26. The device of claim 25, wherein at least one of the electrodes is formed on the approximately V-shaped valley.

27. The device of claim 17, wherein the crystal growth layer comprises a GaN semiconductor.

28. The device of claim 17, wherein the crystal growth layer is grown at a temperature of about 1100°C or less.

29. The device of claim 17, wherein the crystal growth layer is grown at a pressure of about 100 Torr or more.

30. A method of fabricating a semiconductor light emitting device, comprising the steps of:

forming a wurtzite-type compound semiconductor layer on a substrate oriented along a principal plane such that a difference-in-height portion is formed in a surface of the wurtzite-type compound semiconductor;

forming a crystal growth layer at least a portion of which is oriented along an inclined plane inclined with respect to the principal plane by crystal growth on the surface; and

applying a first conductive cladding layer, an active layer, and a second conductive layer in a stacked arrangement along a region extending in parallel to said inclined plane.

31. The method of claim 30 comprising the steps subsequent to the applying step of:

5 forming a first mask material layer, forming a first window region in the first mask material layer, and forming a first electrode layer through the first window region; and

forming a second mask material layer, forming a second window region in the second mask material layer at a position different from that of the first window region, and forming a second electrode layer through the second window region;

10 wherein one or more light emission regions having different characteristics are formed by using the first electrode layer and the second electrode layer.

32. The method of claim 30, wherein the semiconductor light emitting device is separated into a plurality of light emission regions electrically independent from each other.

33. The method claim 32, wherein an amount of current injected in the light emission regions is capable of being adjusted to establish wavelengths of light emitted from the light emission regions to a desired value.

34. The method of claim 30 comprising the steps subsequent to the applying step of:

forming a resist layer, and forming a specific pattern of an electrode layer by a lift-off process.

35. The method of claim 30 comprising the steps subsequent to the applying step of:

forming a resist layer having a window region, forming an electrode layer to cover said resist layer including an inner region of said window region, and removing said resist layer together with said electrode layer excluding an electrode portion formed on a bottom region of the window region by a lift off process.

36. The method of claim 30, wherein the crystal growth layer is grown at a temperature of about 1100°C or less.

37. The method of claim 30, wherein the crystal growth layer is grown at a
5 pressure of about 100 Torr or more.